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Species of *Aquilegia* Growing in Utah and in Adjacent Portions of Colorado, Idaho and Arizona.

IVAR TIDESTROM.

During the seasons of 1907-09, while botanizing on the Uncompahgre Plateau, Western Colorado, in the Wasatch Mountains, Central Utah, and on the Kaibab Plateau, Northern Arizona, I collected a number of *Aquilegiae*, which proved of particular interest especially so far as the distribution of the species is concerned. Of the species listed by Dr. Rydberg for Colorado, I observed particularly *A. coerulea*, *A. elegantula* and *A. micrantha*.

The first mentioned appears to be not only the most widely distributed species but has also the distinction of being the State flower of Colorado. It occurs throughout Colorado at the higher elevations, usually at 2400 m. and upwards and is very abundant in places on the Uncompahgre Plateau, where I have observed it. This handsome species was first mentioned by James (Long's Expedition, 2:15, 1823) and later described by Doctor Torrey (Ann. Lyc. N. Y. 2:164, 1828). It is readily recognized by its large bi-colored flowers, the sepals being light blue, the petals blue and white. It was illustrated by Hooker (Bot. Mag. 90:t. 5477, 1864), and is too well known to require a description here.

In the Wasatch Mountains we find a white form growing under practically the same conditions as the Colorado plant and differing in no particular from the latter except in the color of the sepals. It was first noticed by Nuttall and described by him under the name *A. leptocera* (Nutt. in Journ. Acad. Sc. Phila. 7:9, 1834) and also illustrated by Hooker (Bot. Mag. t. 4407, 1848). It was described by Doctor Gray as *A. coerulea* var. *albiflora* (Robinson, Gray Syn. Fl. 1:44 1895). At first I thought the Utah form merited recognition as a species but on August 27, 1908, while botanizing on the slopes of Mount Terrell, Central Utah, I met with typical *A. coerulea* growing with the typical Utah form and varying in-

* April 15, 1910.—Pages 165 to 196.

to the latter. With white forms occasionally observed in Colorado amidst typical plants and the reverse obtaining in Utah, no definite specific line can possibly be drawn between the two forms, so Doctor Gray's name is not only appropriate for the Utah form but it is also indicative of its relationship to *A. coerulea*. The forms appear to thrive best in the Aspen region.

On June 27, 1909, while riding over the Kaibab Plateau from Ryan, Arizona, to the Grand Cañon, I observed a very graceful form of an *Aquilegia* hitherto unknown to me. It is frequent in the vast *Pinus ponderosa* area for which the plateau is famous; its position in the system appears to lie between the *A. coerulea* group and *A. chrysantha*. To the former it is related by its sometimes faintly bluish sepals while the long and very slender spurs remind one of *A. chrysantha*. The latter species I collected in April, 1908, on a similar yellow pine (*Pinus ponderosa Mayriana*) area in the Huachuca Mountains, Arizona.

Aquilegia pinetorum nov. sp.

In *A. chrysantha* the length of the sepals to that of the spurs may be expressed by the ratio 7:11, while in the new form the relation is 3:7, or, reduced to a common denominator, the relations will be expressed by 6:10 and 4:10 respectively. In *A. coerulea* the relation is 7:10. It is true that the length of the spur in *A. chrysantha*, and for that matter in many if not in all of the "spurred" species, is a variable quantity; yet the differences are too great to allow our form to be referred to either *A. coerulea* or *A. chrysantha*. The petals in *A. chrysantha* are commonly 12 mm. in length (excluding the spurs), with a rounded or broad and somewhat truncate apex. In our form, on the other hand, the petals approach more nearly the form and size of those of *A. coerulea*. The following diagnosis will serve to further elucidate the species.

Herba perennis, 4 dm. v. altior: caules pauci e caudice crasso, supra ramosi, pubescentes v. glabrori: folia basilaria numerosa, 2-ternata; petioli graciles, 10-15 cm. longi, basi dilatati; petioli secundarii paene filiformes, 1-4 cm. longi, petioluli filiformes, 0.5-1 cm. longi, pubescentes; foliola 2-3-fida, segmentis inciso-rotundato-lobatis, basi rotundata v. cuneata, supra viridia subtus glaucescentia; caulinia minora ternata, simpliciora: flores magni (*A. coerulea* minores) albi; sepala ovato-oblonga, acuta, basi contracta, 3 cm. plus minusve longa, alba v. saepe coerulea; petala spatulata, apice rotundata, calcaribus rectis, tenuibus, 7 cm. plus minusve longis; stamina petala superantia, inaequalia, antheris oblon-

gis, 2 mm. longis; staminodia membranacea; ovaria pubescentia, stylis rectis stamina superantibus; folliculi ignoti.

Hab. In the *Pinus ponderosa* area, Buckskin Mountains, Northern Arizona. (*Tidestrom*, no. 2328, June 28, 1909.)

There is another species, *A. longissima* Gray, which is still more remarkable on account of the length of the spurs. In this species we find the spur sometimes over 1 dm. in length and the relation of the length of the sepals to that of the spurs is sometimes 2.5:10. Of *A. longissima*, I have seen only two specimens, one collected by Dr. E. Palmer in the Caracol Mountains, Coahuila, Mexico, and the other by Dr. V. Havard, in Los Chisos Mountains, Texas, near the Mexican boundary. *A. longissima* differs from our plant by its greater height; by its much larger leaves, with petioles sometimes 3 dm. or longer; and by its linear-oblong sepals.

On August 22, 1908, while riding over the Wasatch Plateau, near the eminence called Wasatch Peak, I met with another *Aquilegia* which does not appear to be related to any of the above mentioned species. It grew at an altitude of 3150 m., in the sand and among the gravel and loose rock which is so characteristic of certain slopes in the Wasatch Mountains. The plant is apparently sub-alpine and very rare, since I have not seen it in other similar localities,—not even on the Big Horse Shoe Summit (3600 m. alt.), some twenty-five miles northward, nor on Mount Terrell (3300 m.). The following is the diagnosis of our form:

Aquilegia scopulorum nov. sp.

Herba perennis, glabra v. supra pubescens, 1-2 dm. alta, multicaulis e radice crassa: folia basilaria 2-ternatisecta; petioli 4-6 cm. longi, basi dilatati; foliola conferta, sessilia, coriacea, venis obscuris, rotundata, basi truncata, trifida, v. lobata, 1 cm. plus minusve lata; caulinia ternata, simpliciora: flores albo-lutei v. albo-coerulei; sepala ovato-oblonga, pallide purpurea saepe coerulea; petala oblonga, apice rotundata, albida; calcaribus tenuibus, 3-5 cm. longis; stamina petala aequantia: ovaria pubescentia; styli tenues, 5 mm. longi; folliculi ignoti.

Hab. On gravelly slopes, Wasatch Peak, Central Utah. (*Tidestrom*, no. 1788, Aug. 22, 1908.)

This plant differs from *Aquilegia coerulea* var. *calcarea* Jones, by its cauline leaves, which in the latter form are 3-sected, with the lobes oval and entire. As to the leaf-form, *v. calcarea* is more closely related to *A. scopulorum* than to *A. coerulea*. In our plant the petioles as well as the leaf-blades and lower part of the stems are glabrous and glaucous. Mr. Jones, however, describes his form as having "petioles

very glandular-hairy, as well as the stems and peduncles." Mr. Jones found his form on a *Pinus ponderosa* area at an elevation of 2100 m., near Cannonville, Southern Utah, but our plant belongs to a region over 100 miles northward and grows at an elevation of nearly 3100 m.

July 8-9, 1908, while riding over the Wasatch Plateau towards Emery, Utah, I had the good fortune of traversing territory which hitherto has lain outside of the beaten path of botanists. While the plants of the plateau are fairly well known, since many species range northward and abound in more accessible regions; a great deal remains to be done in exploring the rugged regions immediately to the east and below the plateau. This region is marked by most rugged "box-cañons," of which "Muddy Creek Cañon" might be cited as a fair example. A little to the south of the latter lies one of the most inaccessible and, up to within two years, impassable, steep and very abrupt cañons. A trail, recently constructed by the Forest Service, enables one now to pass through this interesting region.

From the plateau (approximately 300 m. alt.) one descends the Muddy Creek onto a lower, smaller plateau-like area which is open for a distance of some six or seven miles and covered with a dense *Pinus scopulorum* forest eastward to a line where the "slope" is almost precipitous.

The cañon referred to above is one of the few means of descent from the plateau to the "eastern" desert. Here I found a number of interesting plants among which is the following:

***Aquilegia rubicunda* nov. sp.**

Herba perennis pubescens, 1-3 dm. alta; caules pauci e radice crassa; folia basilaria petiolis elongatis 3-ternatis-secta; petioluli filiformes; foliola 1 cm. plus minusve longa, basi truncata v. cuneata, segmentis cuneata tridentata v. varie lobata, lobis rotundatis: caulinea simpliciora; flores luteirubicundique; sepala avata acuta, rubicunda, 1 cm. plus minusve longa; petala spatulata, pallide lutea, apice rotundata 5-7 mm. longa, calcaribus gracilibus 2 cm. longis; stamina petalis duplo longiora; ovaria glabra, styli tenues; folliculi ignoti.

Hab. Among rocks along the "Link Trail," Manti Nat. Forest, Utah, near Emery. (elev. 2400 m.)

This form, which I at first referred to *A. elegantula* is distinguished from the latter by its uniformly tapering spurs and pink-colored sepals.

Flowers red with some yellow and green.

† *Plants 3 dm. more or less in height, leaf-segments small.*

1. *A. elegantula* Greene, Pitt. 4:14, 1899. Rydb. Fl. Colo. 136, 1906.

Leaves mostly basal on long, slender petioles; flowers commonly 2 cm. in length, pendulous in anthesis; sepals ovate-oblong, greenish, 1 cm. long; the yellow laminae of the petals one half as long as the somewhat saccate, curved spurs; ovaries pubescent, style 15 mm. in length.

Southern Colorado. Mount Carbon. (Tm. 2202).

†† *Plants taller, leaf-segments large.*

Spurs tapering uniformly.

2. *A. rubicunda* Tm.

Leaves on slender petioles sometimes 2 dm. long; flowers commonly 3 cm. in length, pendulous in anthesis; sepals oval, acute, pinkish, 1 cm. long; the light yellow laminae of the petals one-fourth as long as the slender spurs; ovaries glabrous.

Wasatch Mts., Central Utah. (Tm. 2400.)

Spurs somewhat saccate curved.

3. *A. formosa* Fischer in DC. prodr. 1:50, 1824. T. & G. Flora 1:30, 1838. Planch. Fl. des Serres 8:125, t. 795. Gray, Syn. Fl. 1:44, 1895.

A. canadensis var. *formosa*. Wats. Bot. King's Exp. 10, 1871.

Leaves on long petioles; lateral leaflets nearly sessile, the terminal short-stalked; flowers nearly 3 cm. in length, pendulous in anthesis; sepals ovate-lanceolate, acute, 1 cm. or longer; the yellow, truncate or rounded laminae of the petals 5 mm. or longer, the red spur twice as long; ovaries pubescent, styles 1 cm. or longer.

Western Utah and Idaho and westward. (Sawtooth Mts. Idaho. Tm. 2560 and 2785.)

** *Flowers blue with some white or varying to white.*

† *Flowers small.*

4. *A. saximontana* Rydb. in Gray, Syn. Fl. 1:43, 1895; Fl. Colo. 136.

Glabrous, 2 dm. more or less in height; leaves small; sepals oval-oblong, 1 cm. in length; the yellow laminae of the petals somewhat shorter than the sepals and exceeding the blue, hooked spur; ovaries glabrous.

Colorado.

†† *Flowers large.*

§ *Spurs 3 cm. more or less in length.*

a. Sepals light blue.

5. *A. coerulea* James in Long's Exp. 2:15, 1823. Torr. Ann. Lyc. N. Y. 2:164, 1828. Hook. Bot. Mag. t. 5477. 1864. Gray, Syn. Fl. 1:44, Rydb. l. c. 136.

3-6 dm. in height; sepals ovate-oblong, 2.5-3.5 cm. in length, the white laminae of the petals rounded, one-half as long as the blue, slender spurs.

Aspen and Spruce Regions, Colorado. Mount Terrell, Utah. (Tm. 1815.)

aa. Sepals white.

6. *A. coerulea albiflora* Gray, Syn. Fl. 1:44, 1895.
A. leptocera Nutt. Journ. Acad. Phila. 7:9, 1834.
A. leptoceras Hook. Bot. Mag. 1. 4407, 1848.
A. coerulea Wats. Bot. King's Exp. 10, 1871.
A. coerulea var. *ochroleuca* Hook l. c. under t. 5477.

This form appears to differ from *A. coerulea* only in its white sepals.

Aspen and Spruce Regions, Wasatch Mountains, Utah.

§§ *Spurs 6 cm. or longer.*

7. *A. pinetorum* Tm.

Differs from the preceding species by its more slender form and much longer spurs.

Pinus ponderosa Region, Buckskin Mts., Arizona. (Tm. 2339.)

*** *Flowers blue with some purple, yellow or cream-white or entirely purplish white.*

† *Glabrous below, sometimes pubescent above.*

8. *A. scopulorum* Tm. (Plate XI.)

1-2 dm. high from a multicapital caudex; leaves small, leaflets crowded; sepals ovate-oblong, blue or pale purple; petals oblong, whitish; spurs slender, 3-5 cm. in length; ovaries pubescent; styles slender, 5 mm. long.

Subalpine Regions, Wasatch Mts. Utah. (Tm. 1788.)

†† *Glandular-hairy.*

9. *A. scopulorum* f. *calcareo* (Jones) Tm.

A. caerulea var. *calcareo* Jones, Proc. Calif. Acad. Sc. Ser. II, 5:619, 1895.

Pinus ponderosa area near Cannonville, S. Utah, alt. 2100 m. Jones.

**** *Flowers yellow.*

† *Spur wanting.*

10. *A. Eastwoodiae* Rydb. Bull. Torr. Bot. Cl. 29:146, 1902; Fl. Colo. 136.

A. ecalcarata Eastw. Zoe, 2:226, 1891; 4:3, 1893; Cal. Acad. Sc. Ser. II, 4:560, t. 18 in 1895. Gray, Syn. Fl. 1:43.

I have seen no specimens of this species.

S. W. Colorado.

†† *Spur 2 cm. or shorter.*

§ *Glandular-pubescent.*

11. *A. micrantha* Eastw. Proc. Calif. Acad. Sc. Ser. II, 4:559, t. 19. Gray, Syn. Fl. 1:43. Rydb. l. c. 136.

A slender species, 3 dm. or taller; leaves on short petioles; flowers 2 cm. or somewhat longer; sepals ovate-oblong, acute, 1 cm. long; petals truncate or nearly so, spur slender: follicles 1 cm. or somewhat longer, viscid-pubescent.

In cañons, S. E. Utah and southward.

§§ *Glabrous or nearly so.*

12. *A. flavescens* Wats. Bot. King's Exp. 10, 1871. Gray, Syn. Fl. 1:43.

A. canadensis var. *aurea* Regel, Gartenfl. 21:t, 734.

5 dm. or higher, branching; leaves on long petioles; sepals ovate-oblong, spreading, 1.5-2 cm. long; the broad laminae of the petals one-half as long as the somewhat curved spur; follicles 2 cm. in length, pubescent.

Aspen and Spruce Regions, Wasatch Mountains, Utah.

A. flavescens f. *minor*, Subalpine, smaller and more hairy. Wasatch Plateau. (Tm.)

††† *Spur 4 cm. or longer.*

13. *A. chrysantha* Gray, Proc. Am. Acad. 8:621, 1873; Syn. Fl. 1:44, Masters, Gard. Chron. 1873, f. 304, Rydb. l. c. 137.

A. leptocera var. *chrysantha* Hook. f. Bot. Mag. t. 6073, 1873.

5 dm. or taller, glabrous below; sepals lanceolate-oblong; 2 cm. or longer; the slender spur about four times as long as the broad laminae of the petals; follicles 2 cm. or longer.

Southern Colorado and southward.

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An Analytic Study of Faunal Changes in Indiana.

WALTER L. HAHN.

REPTILES AND AMPHIBIANS.

We have less direct evidence regarding present and former numbers of these classes than any other conspicuous group in our fauna. Several local histories mention snakes and es-



***Aquilegia scopulorum* Tm.**
PLATE XI. TIDESTROM on AQUILEGIA.